DOCUMENT RESUME

ED 051 778 HE 002 300

AUTHOR	Rogers, Kenneth A.
TITLE	Improving the Latin American Engineering Student's Experience in the U.S. University.
INSTITUTION	National Association for Foreign Student Affairs, Washington, D.C.
PUB DATE	71
NOTE	14p.; Abstract of a Panel Discussion Sponsored by the National Association for Foreign Student Affairs
AVAILABLE FROM	National Association for Foreign Student Affairs, 1860 19th Street, N.W., Washington, D.C. 20009 (1.00)
EDRS PRICE	EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS	*Educational Experience, *Engineering Education, *Foreign Students, Higher Education, *Student Experience

ABSTRACT

This report resulted from a conference convened to discuss the special needs of Latin American students in the US and the relationship between academic courses offered and educational needs and career opportunities at home. The conference focused on business administration and engineering, fields attracting the largest number of Latin American students. Separate reports on the 2 fields were published. Part I of this report covers the prospective student's goals, preadmission guidance, selection and admission, predeparture and post-arrival orientation; Part II deals with his personal academic and work experiences in the US; Part III briefly discusses the placement of returning graduates and the possible usefulness of alumni and professional associations. Seventeen recommendations are summarized. (JS)

ED051778

IMPROVING THE LATIN AMERICAN ENGINEERING STUDENT'S EXPERIENCE IN THE U.S. UNIVERSITY

Abstract of a Panel Discussion Sponsored By The National Association for Foreign Student Affairs

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HE002 300

NATIONAL ASSOCIATION FOR FOREIGN STUDENT AFFAIRS
1971

Published by the

National Association for Foreign Student Affairs
1860 19th St., N.W.
Washington, D.C. 20009

Price $1.00

ED051778

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Abstract of a Panel Discussion Sponsored By
The National Association for Foreign Student Affairs

University of Houston
Houston, Texas
March, 1970

Panel:

Frank M. Tiller
Morris Asimow
Robert B. Banks
Guy Fauconneau
Gerald Fleischer
Charles F. Warnock
Frank Worley, Jr.

National Association for Foreign Student Affairs
1971

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PREFACE

This report is a companion to that of a panel of experts in Business Administration published earlier this year by the National Association for Foreign Student Affairs (NAFSA). The two panels convened in Houston, Texas, in March 1970 under the sponsorship of the Committee on Latin American Students of NAFSA. The purpose of this meeting outlined in the preface to the report submitted by the Business Administrators was: ". . . to look into ways of improving the experience of Latin American students in U.S. universities in the fields of Business Administration and Engineering. Two panels of distinguished academicians met concurrently over a three day period. While their conclusions in several instances were similar, in other areas there was some divergence. Consequently, separate reports were prepared. . . . .

"The Conference was organized by the National Association for Foreign Student Affairs (NAFSA) and one of its Committees, the Committee on Latin American Students (CLAS), the first NAFSA Committee to concern itself specially with students from one geographic area. The organization of this committee was made possible by a grant to NAFSA in the fall of 1966 by the Standard Oil Company of New Jersey.

"One of the first activities of CLAS was to commission a survey of the attitudes and expectations of Latin American Students in a selected number of United States Universities. The results of this survey, conducted by Dr. Gordon Ruscoe of the Center for Development Education at Syracuse University, were published by NAFSA in 1968. This lead to a conference, held at Sterling Forest Conference Center which made specific recommendations on ways of implementing suggestions made in the Ruscoe report. This is not the place to summarize the important recommendations which were made in the report on the Sterling Forest Conference prepared and distributed by NAFSA. Brief mention, however, should be made of the areas in which significant action has already taken place.

"One recommendation was that more up-to-date material be made available to admissions and placement officers regarding the backgrounds of Latin American students. In December 1968 a workshop was held in San Juan, Puerto Rico. A published report entitled 'The Admission and Placement of Students from Latin America' came from that conference. The countries covered were Brazil, Central America, Colombia, and Venezuela. In December, 1970, with the collaboration of the American Association of Collegiate Registrars and Admissions Officers (AACRAO), a second workshop was held covering Argentina, Chile, Ecuador and Peru.

"The Sterling Forest Report was much concerned with the necessity of providing adequate predeparture orientation for students enrolling in U.S. universities. To this end there has been established the 'Council on In-Country Orientation,' which has already conducted surveys on those orientation programs already being conducted in Latin America. The Council is currently preparing a report on recent developments in pre-departure orientation for Latin American students.

"The present report has its genesis in another Sterling Forest Conference recommendation, that

> '. . . a workshop or conference be set up. . . to discuss the special needs of students from Latin America and also the relationship between the academic courses offered and the educational needs and career opportunities in their homelands.'

"Because the two fields of study in the United States which attract the largest number of Latin American students are Business Administration and Engineering, it was decided that a conference should focus on these areas. Dr. Frank Tiller, Director of the Center for Study of Higher Education in Latin America, of the University of Houston, agreed to serve as Conference Coordinator and as Director of the Engineering group. Dr. Melvyn Copen, Associate Dean of the College of Business Administration, also of the University of Houston, was selected as Director of the Business section."

The Panelists representing the two disciplines met in Houston. The two groups, working independently, compared their findings only on the final morning of the three day session. It was hoped that the conference would produce concrete proposals to make the educational experience of Latin American students more relevant, and that this might be accomplished within the existing university structure and within the existing academic framework. The conclusions of and the suggestions made by the Panelists in Business Administration were published as *Improving the Latin American Business Student's Experience in the U.S. University.*

The Engineering Report—a synthesis of ideas presented formally and informally by the participants was prepared by Kenneth Rogers, Director of the International Office of Washington University in St. Louis. This report endeavors to reproduce the spirit of the conference intact, although the sequence of ideas may differ from that of the actual conference.

NAFSA would like to take this opportunity to express its thanks to Dr. Frank Tiller of the University of Houston, and to the panelists. Special thanks are due to Dr. Guy Fauconneau of the University of Pittsburgh, for his suggestions and assistance in the preparation of this final report.

Special note should also be made of the proposal made by Dr. Tiller, and discussed by the panelists, for the establishment of a permanent organization to evaluate the educational opportunities offered, not only to Latin American students, but to all international students in U.S. School of Engineering.

NAFSA is once again extremely appreciative of the continued financial support from the Standard Oil Company of New Jersey which made possible both the conference and this report.

Henry Holland
Chairman
NAFSA Committee on Latin American Students

Colby College
Waterville, Maine
April, 1971

IMPROVING THE LATIN AMERICAN ENGINEERING STUDENT'S EXPERIENCE IN THE U.S. UNIVERSITY

INTRODUCTION

Through the presence of more than 25,000 foreign engineering students in U.S. colleges and universities, engineering educational programs are confronted with the many and varied technological and trained manpower requirements of the world's developing areas. If this challenge is to be met effectively, institutional practices and policies must be re-examined and made more responsive to the educational needs and career prospects of the foreign students.

Most of the foreign students now attending engineering schools in this country come from technologically underdeveloped nations in Asia, Africa and Latin America. Their cultural traditions, values, objectives and employment prospects are thus very different from those of American students. Their educational needs also vary widely and, unfortunately, since more often than not they are imperfectly understood both by themselves and their American advisers and professors, foreign students are frequently placed in educational programs that are neither suited nor planned to meet their requirements.

Engineering educational programs in the United States aim to prepare students for the changing demands of a dynamic industrial society. Engineering curricula are designed to meet conditions which differ radically from those present in the home countries of visiting students. Furthermore, programs of study tend to develop specialists in areas which may not be of immediate importance to nations whose technical and scientific development is not comparable to that of the United States. As a consequence, the professional preparation of the foreign engineering students tends to ignore the urgent necessities of their own countries.

When a student remains for several years in a system geared to objectives which differ from those of his country, he may lose contact with his homeland and decide to remain in the United States. On the other hand, disillusionment and frustration are often experienced by those who do return. Lack of relevant training and experience, as well as unfamiliarity with developmental problems and processes, contributes to their re-entry trauma.

The urgent necessity of finding solutions to the special problems faced by Latin American students led the NAFSA Committee on Latin American Students to recommend in 1969 that a group of engineering educators with a background of work in Latin America be brought together to consider ways of improving the educational experience of Latin American students in this country and to make that experience more relevant to the needs of their home countries. On March 12-14, 1970, a panel of distinguished engineering educators convened in Houston for this purpose. Members of the panel were: Dr. Frank Tiller, University of Houston (Chairman); Dr. Morris Asimow, UCLA; Dr. Robert Banks, Ford Foundation, Mexico City; Dr. Guy Fauconneau, University of Pittsburgh; Dr. Gerald Fleischer, University of Southern California; Dr. Charles Warnock, Colorado State University; and Dr. Frank Worley, University of Houston.

Although essentially its task was to take a fresh look at basic problems, the panel took advantage of the findings of earlier NAFSA studies in its deliberations. Of particular value in this regard were the Ruscoe Study of Latin American Students in U.S. Colleges and Universities (1968), and the Bridgers-Hall *Report on Pre-Departure Orientation in Latin America* published in 1969.

A number of broad topics, including counseling and guidance, student goals, undergraduate and graduate curriculum, work experience, and U.S. institutional commitments to international education were discussed with a view to making specific recommendations for:

(1) the improvement of the orientation of the students *prior* to departure from Latin America and *following* their arrival in the U.S.;

(2) the adaptation of study programs, counseling and practical training to the needs of Latin American students enrolled at U.S. colleges and universities; and

(3) the improvement of job placement services, orientation for "re-entry" and relations with foreign alumni.

The organization of this report reflects this approach insofar as it focuses on the student and his needs before he begins his studies, during his studies and after he completes his studies and returns to his home country. The final section deals with alternative modes of implementing the panel's recommendations.

SUMMARY OF RECOMMENDATIONS

1. In attempting to provide the Latin American engineering student with an appropriate educational experience, the U.S. host institution must take into account his study and career objectives.
2. The study/career objectives of Latin American engineering students should be surveyed and the results of such a survey should be disseminated throughout the U.S. educational community.
3. Effective in-country guidance programs should be developed to provide prospective students with essential information and reliable advice on the educational programs of U.S. institutions and career opportunities in their home countries. To support this effort,
   (a) Returned graduates of U.S. institutions should be enlisted as counselors to prospective students;
   (b) U.S. colleges and universities should augment the flow and increase the distribution of pre-admissions information to prospective students; and
   (c) U.S. Government missions (AID, USIS, etc.), educational foundations and private business enterprises in Latin America should cooperate with host country agencies and institutions in the collection and dissemination of published information on career opportunities, trained manpower needs and priorities, etc.
4. The flow of reliable information between prospective students and the U.S. institutions they propose to attend must be increased and there is a continuing need to strengthen existing procedures for selecting and admitting foreign students to graduate and undergraduate engineering programs. In this regard,
   (a) Graduate admissions committees should be provided with basic reference materials and authoritative guidance on the evaluation of Latin American educational credentials; and
   (b) There should be a wider exchange of information and experience regarding the admission of foreign students among U.S. engineering schools.
5. Pre-departure orientation should deal comprehensively with the main historical, social, economic and cultural aspects of the U.S. as well as the organization, policies, and practices of American institutions of higher learning. Recent graduates of U.S. colleges and universities should be utilized in orientation lectures, seminars, and counseling programs.
6. Post-arrival (campus) orientation and counseling programs should be organized and carried out cooperatively by the foreign student adviser and the academic departments under whose supervision the students will pursue their studies. It was further recommended that a high level committee be established within the university which would determine institutional policy with respect to foreign students and backstop the foreign student adviser in the implementation of essential programs and services for foreign students.
7. Through intensive counseling prior to or at the time of enrollment, educational needs and problems of the student from Latin America should be identified and evaluated by the host institution. Wherever possible, responsibility for such counseling should be assigned to a member of the faculty who has had experience in Latin America, or shared by such "country or regional advisers" and regularly designated academic field advisers.
8. To the extent possible, the curricula of U.S.-engineering schools should be oriented to the needs of developing societies. In order to accomplish this, data on the employment patterns and industrial needs of particular regions will have to be collected and analyzed. Alumni should be utilized as a source of such information. (See Recommendation No. 16 below.)
9. Existing undergraduate and graduate curricula should be made as flexible as possible through the use of waivers and electives so that Latin American engineering students will have the opportunity of studying socioeconomic development, entrepreneurship, and public administration.
10. Special developmental courses for foreign graduate and undergraduate students should be offered by the host institution, and/or through consortia. These courses, which could be given during the regular academic year or in summer institutes, might consist of semester-length seminars, or intensive (one to two) week courses given at intervals throughout the year.
11. At the graduate level a special effort must be made to encourage students to adopt thesis topics and research projects which relate to specific problems encountered in the developing nations. Latin American institutions should be invited to communicate their research interests and plans to U.S. colleges and universities so that thesis advisers could be made aware of these undertakings in the counseling of Latin American students.
12. Latin American engineering students must be given a practical exposure to industrial environments compatible with the present or the planned degree of industrialization of their home countries. This may require the establishment of special courses or training programs with small- and medium-sized industrial firms. Opportunities for internships in regional agricultural establishments, local and state government departments should also be explored.
13. Since there is a strong possibility that the Latin American student may enter public service when he returns to his home country, he should be given some opportunity to observe and work with various federal government agencies. For those students who contemplate careers in education, opportunities for participating in university administration should be provided by U.S. host institutions.

14. U.S. engineering colleges should encourage corporations which operate in Latin America to recruit and give practical training to Latin American students in the United States. This practice would both provide a useful work experience for the student and improve the effectiveness of the firm's recruiting efforts.

15. Overseas alumni and professional associations could do much to bring returning graduates into contact with prospective home country employers, thereby reducing some of the uncertainties, anxieties and disappointments of "re-entry."

16. U.S. engineering schools should view overseas alumni and professional associations as channels for communication with returned graduates. Through these organizations, educational planners in this country can monitor and evaluate the experience of returnees and in the process obtain valuable feedback on the quality and the relevance of U.S. professional study and practical training programs.

17. A permanent organization, which would have responsibility for evaluating, on a continuing basis, the international education programs of U.S. engineering schools should be established.

PART I. THE PROSPECTIVE STUDENT

His Goals

The degree objectives of the Latin American engineering students who come to the U.S. are at best only tentative indicators of career goals. Over and above these objectives are motives and expectations that may or may not be well-founded.

At the outset, the panel drew a clear distinction between those students who intend to stay in this country, and those who will return to their own countries to work as practicing professionals or to pursue careers in academic institutions. Although a number of Latin American students do not return home upon completion of their studies, the panel's attention was primarily directed to the needs and problems of the students who do.

In subsequent discussion, an attempt was made to identify the main goals of the prospective student. While foreign students generally seek admission to our colleges and universities because programs of comparable quality or sophistication are not available locally, it was felt that the desire for "adventure" (the broadening experience of life in the U.S.) as well as the prestige and upward social and economic mobility signified by U.S. degrees are important factors in the Latin American student's decision to come to this country. The experience of several panel members indicated that many Latin American students are also impelled by essentially altruistic motives: i.e., a personal commitment to service in the modernization of their countries.

Thus, in attempting to provide Latin American students with an appropriate educational experience, the admitting college or university in the U.S. must be cognizant of goals and expectations of the prospective student. To this end, the panel recommended that research be undertaken, and that the data collected be disseminated as widely as possible within the university community and individual institutions.

Pre-Admissions Guidance

The success of the foreign student's educational experience in the U.S. is as much dependent upon effective pre-admission guidance as it is upon the scope and quality of the orientation and counseling he receives before and after he begins his studies at an American institution. The panel felt that while much work has already been done in each of these areas, there remain many gaps to be filled, many needs to be met.

The needs of the prospective student are among the most urgent. At present, Latin American students who contemplate the study of engineering in the U.S. frequently lack sufficient guidance—in the form of information and advice—to be able to select institutions which offer programs that are appropriate to their individual career goals. They may be further handicapped by their inability to obtain reliable data on career opportunities in their home countries. As a result, students are often misled or mislead themselves into coming to U.S. institutions with expectations that cannot be fulfilled either by themselves or by the institutions involved.*

By improving in-country guidance and the flow of reliable information between the prospective students and the institutions they propose to attend, the panel felt that the task of U.S. colleges and universities in the admissions process would be greatly reduced, since prospective students would be able to engage in intelligent and informed self-selection. For this reason, U.S. engineering schools have a real stake in closing the "information gap" and must become actively involved in augmenting the flow and increasing the distribution of pre-admissions information to prospective students —both directly and through interested agencies here and abroad. The panel further recommended that U.S. missions, educational foundations, and private business enterprises in Latin America work closely with appropriate host country authorities and agencies in collecting and disseminating, through publications and other media, data on career opportunities, and trained manpower needs. Finally, colleges and universities in the United States should cooperate with counterpart in-

*See also *The Foreign Student: Whom Shall We Welcome?* Education and World Affairs, New York 1964.

stitutions in Latin America to establish in-country guidance information centers to assist students contemplating study in the U.S. Wherever possible, returned graduates of U.S. institutions should be utilized as counselors for prospective students.

Selection and Admission

Until the goal of self-selection is realized, the key to better quantitative and qualitative control of the student traffic between Latin America and this country may be found in strengthening the selection and admissions procedures of United States colleges and universities.

The inability of many university admissions committees to identify the goals and evaluate appropriately the educational credentials of Latin American applicants suggests the existence of another serious "information gap." This problem is especially acute at the graduate level where the selection of prospective students is handled by departmental committees whose members may be unfamiliar with Latin American educational systems and standards. As a consequence, they may find it extremely difficult to satisfy themselves that an applicant has the requisite qualifications to succeed in the particular program for which he has applied, much less determine that he has a realistic understanding of what that program offers and how it may lead to the fulfillment of his career goals.

Because much attention is being given to this problem within NAFSA, and since our principal concern was curriculum, the panel limited itself to a very brief discussion of procedures for the selection and admission of Latin American engineering students. It did, however, stress the importance of obtaining more information about applicants and of strengthening procedures at all levels. The need for providing graduate admissions committees with basic reference materials for and guidance on the evaluation of Latin American educational credentials was also cited. Finally, the panel called for a wider exchange of information on the admission of Latin American students within the community of U.S. engineering schools.

Pre-Departure and Post-Arrival Orientation

It is difficult to over-estimate the importance of preparing foreign students to meet the challenge of study in the United States through effective pre-departure and post-arrival orientation. Prior to his arrival in the United States, the student must know what to expect, and once he arrives, he must receive special counseling that will help him to adapt to the demands of a new and unfamiliar environment. These requirements are not peculiar to Latin American students of engineering; they are shared by all foreign students, regardless of their field of study.

Since the scope and quality of existing pre-departure orientations programs has been the subject of critical investigation by a team of NAFSA specialists which visited Latin America in 1969, the panel largely concerned itself with the substantive issues of program development. Discussion focused particularly on the need to acquaint students with the main historical, social, economic, and cultural aspects of the United States through lectures, seminars and publications devoted to such topics as political structure and levels of government, foreign policy, finance and economics, demography and geography, minority group problems, educational systems, labor and management relations, and other facets of contemporary American life. Preliminary orientation programs should also be concerned with introducing students to the practical aspects of living and surviving on an American university campus. Such topics as university organization and administration, public versus private institutions, costs and financial aids, social and political life on campus, grading systems and graduation requirements, and resources for assistance for foreign students should be treated systematically.

Finally, the panel called for the development of predeparture orientation programs which would make maximum use of host-country nationals who are recent graduates of U.S. institutions. The University of El Salvador's 1969 seminar project illustrates the potential of "returnees" as orientation counselors. *

Turning to the matter of post-arrival orientation, the panel saw a need for U.S. institutions to develop more effective campus reception and orientation programs. To this end, it proposed that each university or college establish a high level committee with responsibility for establishing policy with respect to foreign students. Where such a body is not present, the foreign student adviser frequently has difficulty in obtaining the assistance and support of the academic departments in carrying out his responsibilities for the reception, orientation, and subsequent counseling of new foreign students. A policy group of this type could also have considerable influence in the matter of adapting the academic policies of the university to the varied needs of its foreign students.

Beyond this, the panel believed it essential for the foreign student office (FSA) to maintain close liaison with those responsible for foreign student admissions and academic counseling in the various departments throughout the university. It was further suggested that members of departmental admissions committees be encouraged to consult with and seek assistance from the foreign student advisor in developing effective procedure for screening and selection, evaluating credentials, placement and orientation.

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* Last year, at the University of El Salvador, monthly seminars were presented by recently-returned M.S. and Ph.D. holders on the subject of their experiences as graduate students in the U.S. All prospective students were required to attend these seminars.

PART II. THE STUDENT'S EDUCATIONAL EXPERIENCE IN THE UNITED STATES

Student Problems

Most foreign engineering students come from nations whose technological development lags far behind that of the United States. However adequate their preparation for U.S. undergraduate or graduate programs, few have a real grasp of developmental problems and processes. This deficiency is seldom corrected in the course of their study or practical work in the U.S. In fact, because they are usually given the kind of education which is adapted to U.S. employment patterns and are rarely trained in design, management, enterprise and creative engineering, they may experience severe "re-entry reactions" when they return to their home countries.

It does not necessarily follow, however, that U.S. educational programs are totally or even largely irrelevant to the foreign engineering student's needs. Rather, it is when the needs of the foreign student are not carefully evaluated by the U.S. host institution, and he is inexorably forced into the same mold as his American students, that frustration is likely to occur.

Masters and doctoral students' research is also badly handled in many institutions. All too often students are found to be concentrating on highly theoretical problems instead of working on projects which are more applicable to the problems encountered in a developing nation. And in some instances, thesis advisers are too preoccupied with furthering their own research to find problems suitable for the foreign student.

Industry and government cooperate with engineering schools in supplying part-time, co-op, and summer jobs for students enabling them to gather valuable experience. Unfortunately, at present foreign students have little hope of obtaining industrial or governmental experience which could be invaluable to their future careers.

Curricular Problems of U.S. Institutions

There are differences in opinion among U.S. educators in regard to the direction that should be taken in meeting the academic needs of foreign students. On the one hand, the view is often expressed that engineers in developing countries need the type of education prevalent in this nation thirty years ago. On the other hand, Latin American educational authorities have indicated that since returning students may be employed along side with other U.S. graduates, it is essential that they receive an equivalent education. Although apparently contradictory, both views could be valid since each region and each individual presents a different problem.

It is also dangerous to assume that what is needed by an engineer who will work in the industrial South of Brazil is the same as what may be required by one who will practice in Nicaragua, Trinidad, Paraguay, or the Northeastern area of Brazil itself. By the same token, future professors returning to various universities within a single country may each require a completely different type of educational preparation—ranging from concentration on highly theoretical problems to work in purely technical areas.

Because of the bewildering diversity of individual training requirements, some general guidelines must be developed for use by U.S. educators. Both regional and individual requirements must be identified and the general needs of a country or region should be defined carefully. The general educational level, numbers of local engineers, type of engineering training needed as a function of local conditions, and ability to absorb advanced technology are all significant. Engineers returning to agricultural areas without roads, mountainous regions, arid countries, or small islands all face different problems.

The age, maturity, and previous educational background of the student materially influence the desired type of curriculum. A student who plans to return to teach electrical engineering may require more theoretical education than one returning to the power generation field. The recommended educational pattern should be influenced as much by the individual and the position to which he will return as by the general educational needs of the country.

Curricular problems abound. A mature individual coming to the United States to take an undergraduate degree or even a Master's degree may find that he is required to take electives in the Humanities and the Social Sciences. He may spend a good deal of time studying Literature or Local Government, and yet may never be introduced to the Economics of developing countries through an appropriate course of study. Ironically, at a time when his services as a professor may be critically needed in his home university, the student may be compelled to remain in the United States an extra semester in order to take courses which are required of all U.S. students.

Areas for Action

Many of these problems can be effectively solved within the framework of existing university policies and practices. Thus, by making existing curricula more flexible, it may be possible to accommodate many of the Latin American students' special needs. This approach would call for a careful evaluation of each student's requirements and the use of electives and waivers to provide him with a course program that minimizes the possibility that he will return to his country with inadequate or inappropriate training.*
Since the specific needs of individual students can best be identified and evaluated through counseling it was recommended that, wherever possible, faculty members with experience in Latin America be designated as advisers to Latin American students. Together with their colleagues who are responsible for advising students on specific academic fields, these "regional or country advisers" can do much to modify the U.S. oriented curriculum so that it more closely suits the needs of the individual Latin American students. **

*See also, *Improving the Latin American Business Student's Experience in the U.S. University,* NAFSA, 1971.

**Ibid.

1) UNDERGRADUATE CURRICULUM

One of the obvious difficulties in developing detailed curriculum suggestions for Latin American Engineering students stems from the problem of defining the engineer's roles in Latin America. These roles are very different from those played by engineers in the United States. In many cases engineers in Latin America often have many careers which are only remotely related to engineering. Hence one of the difficulties in structuring a curriculum outside of its technical content.

There was no agreement on the desirability of developing special core curricula for Latin American engineering students, but many present felt that foreign students in general, and Latin American students in particular, should have the opportunity to study socio-economic development, entrepreneurship, and public administration.

It was also generally recognized that at the undergraduate level, the only relative freedom that one has in adjusting the curriculum is in the Humanities-Social Science electives and in the technical electives. It was strongly felt that Latin American engineering students should be allowed and encouraged to utilize these electives to take courses in:

Principles of Accounting	Economic Development
Engineering Economics	Political Science
Statistics and Probabilities	Sociology
Microeconomics	Entrepreneurship
Macroeconomics	Public Administration

It was recognized by the panel that some of these courses run against the ECPD recommendations for a balanced curriculum for U.S. undergraduate engineering students, particularly most of the courses in Business Administration. These business courses, however, are very desirable for Latin American students. One extenuating factor in favor of allowing more courses of this nature is that most Latin American students come better prepared from high school in the Humanities than their U.S. counterparts.

With regard to those students interested in a career in the manufacturing sector, the problem becomes even more complex since in addition to the courses listed above, a practical component is necessary. Ideally, these students should have such courses as

Manufacturing Processes (Including Economic Aspects)
Material Sciences
Design of Equipment

and a period of practical experience in a small manufacturing firm in the U.S.

This last step, however, is more easily described than taken since it was recognized that most potential employers give low priority to such jobs and placement offices in many universities do not have the capabilities to handle the special problems of foreign engineering students.

2) AT THE GRADUATE LEVEL

Although graduate level engineering curricula generally offer the student considerably more opportunity to take courses above and beyond those required in his program, more course offerings which are of particular interest and value to foreign students must be developed.

It would appear that the main difficulty at this level lies in the area of research. Yet, this is where the Latin American engineering student has the most potential for work relevant to his country.

It was felt that at the graduate level what was needed was not primary changes in the engineering curricula but rather additions in those areas dealing with administration, economics, and development. The technical content of U.S. engineering programs is indeed appropriate to the needs of the Latin American engineers. The problem lies beyond the technical courses. The suggestion was made that perhaps the ideal curriculum for Latin American engineering students interested in a non-academic career is one combining an M.A. in engineering plus an M.B.A. (modified along certain sequences suggested by the panel in Business Administration).*

It was also the opinion of some of the Engineering Panelists that a doctoral program in Engineering, as presently structured in the United States might in fact be not only a waste of time and effort for the Latin American Engineering Student, but might even be a possible detriment unless new programs emphasizing entrepreneurship and development are created.

Our recommendation, then, is not so much that Engineering Curricula at the Graduate level be changed, but rather that students from Latin America be guided away from the highly theoretical advanced degrees and toward the curricula in business administration, economic development, along with periods of practical experience.

The International Development Technology Program which has been established at Washington University in St. Louis suggests another approach which may be adopted by institutions with high enrollments of foreign engineering students.** Under the IDT Program opportunities for coordinated study of the complex interrelationships between technology and the dynamics of economic development are made available to students who are M.S. candidates in various departments of the School of Engineering and Applied Science. While no formal degree in International Development Technology is offered, several departments permit up to twelve IDT credit hours to be applied towards fulfillment of M.S. degree requirements.

In this innovative program, projects related to the application of technology to problems in international development may be undertaken either at the University or at cooperating institutions. Courses offered include an International Development Technology Seminar, Special Topics in International Development Technology, Transfer of Technology to Developing Countries, and independent work on particular aspects of the problems and processes encompassed by the IDT Program. Relevant projects include the development of roofing systems for tropical areas, and the application of satellite communications to educational development.

Students involved in the IDT Program will acquire an awareness of international development needs and the role of their profession in meeting those needs.

*_Improving the atin American Business Student's Experience in the U.S. University._ NAFSA, 1971.

**See also, "An International Development Technology Center," Robert P. Morgan, _Engineering Education_, Vol. 60, No. 3, November 1969.

They will have had some practice in applying themselves to the solution of real problems. In addition, they will be made aware of the interaction between technology and the broader set of cultural, economic, and business factors which oftentimes limit technological innovation.

The International Development Technology Program represents one viable approach to satisfying the needs of foreign engineering students. Much could also be achieved through the simple expedient of making Master's degree requirements more flexible for foreign students. This method would involve dropping courses which have little or no relevance to experience which the students will subsequently encounter in their own countries in favor of courses in development studies. With respect to Latin American students, the panel emphasized the necessity of developing research projects for graduate theses which are relevant to the needs of Latin American countries. To support this effort, it was suggested that Latin American institutions be invited to communicate their research interests and plans to U.S. colleges and universities in which Latin American students are enrolled. In that way, thesis advisers could be informed of current research needs and priorities.

3) WORK EXPERIENCE

Practical training—the opportunity of relating educational experience to more practical forms of work experience—is extremely important to the Latin American student. This is especially true when the student's previous background does not include exposure to the operations and methods of business or government. Lacking this exposure, he is likely to be confused or unable to reconcile the U.S. professional environment to the condtions he encounters when he returns home.

In the panel's opinion, Latin American engineering students must be provided with a practical exposure to surveying, manufacturing processes (machine shop), design, and other fields relevant to the kinds of conditions they will face when they return to their home countries. In some instances, this may require the establishment of special courses and training programs with small- and medium-sized business firms. In other instances, it calls for cooperation with regional agricultural research establishments, municipal departments, state highway departments, and other public agencies in providing full-time internships for foreign engineering degree candidates.

The type of practical training experiences indicated above are preferable to those currently obtained by many Latin American students who work for eighteen months in large U.S. corporations in an effort to gain experience before returning home. The panel felt that such assignments may not be optimally beneficial except where the student is working with a U.S. corporation in preparation for an assignment in one of its Latin American subsidiaries.

By the same token, it is important that the Latin American engineering student be given some opportunity to observe and work with various federal government agencies, since there is a strong possibility that he may enter public service when he returns to his home country. The better his understanding of how government agencies operate, and the mechanisms which tend to relate public and private operations, the more effective he is likely to be.

Similarly, the U.S. host institution should provide students who are future professors with opportunities for participation in university administration. This may be accomplished by including young Latin American scholars on departmental committees or by introducing them to the structure and operations of the university through a series of lectures or seminars. Further, the panel felt that the possibility of developing formal courses in engineering laboratory management for future professors should be investigated.

Finally, it is important for U.S. colleges of engineering to encourage U.S. corporations which operate in Latin America to recruit Latin American students in the United States. Such practices both provide useful job experience for the student and improve the effectiveness of the firm's recruiting efforts. At present, the recruiting process is often left exclusively in the hands of subsidiaries. In the panel's view, this practice is both wasteful and uneconomic. If more U.S. companies were aware of the opportunities they are overlooking, more would recruit host-country nationals here in the United States.

Although the importance of exposing students to the functions of business, government and educational institutions is generally recognized, the problems of establishing special internship and practical training programs of the type envisioned here are enormous. Some of these problems may be alleviated, and in the long-run overcome, through the cooperative efforts of interested engineering educators, community and business leaders, and public officials at the local, state and national levels.

PART III. THE RETURNING GRADUATE

One measure of the effectiveness of U.S. educational programs and services for foreign students is the proportion of individuals returning to a successful career in their home countries. Existing programs and practices must be studied in order to identify factors which seem to contribute to successful "re-entry." For the same reason, the experiences of returned students should be monitored and evaluated on a continuing basis.

Post-Graduate Placement

The recent Steiner-Arauco investigation* of the recruitment of Latin American students in the U.S. for U.S. firms operating in Latin America underscored the need for more efficient and effective procedures for the placement of Latin American graduates of U.S. institutions. At present, potential employers in Latin America—including the subsidiaries of U.S. corporations—seldom recruit professional personnel on U.S. campuses. As a result, university placement offices and foreign student offices play a very minor role in locating suitable home country employment for graduates of engineering and business schools. In fact, for most Latin Americans studying in this country, there is no established path toward a job with a U.S. company operating in their home countries.

The panel's earlier recommendations concerning the establishment of in-country guidance programs, the dissemination of information on career opportunities, and campus recruiting by U.S. firms with Latin American subsidiaries would, if implemented, serve to enhance re-entry by eliminating many of the uncertainties, anxieties, and disappointments that returning graduates encounter in seeking professional employment.

Alumni and Professional Associations

Overseas alumni and professional associations could also do much to alleviate the re-entry problems of returning graduates through bringing them into contact with prospective employers in the home country. Even if such a "job registry" service were not explicitly provided, such organizations could, through their meetings, facilitate informal contacts which in turn could lead to jobs.

It is to be hoped that overseas alumni and professional associations will, through their increasing involvement in in-country guidance and orientation programs, draw upon the relevant insights and experience of members who have recently returned from study in an American college or university. Such activities will of course be of some therapeutic value to the returnee who is attempting to re-establish himself in his home community. But, more importantly, the knowledge the returnee can impart to the next generation of overseas-bound students is vital. **

Finally, overseas alumni and professional associations have great potential as channels for communication between U.S. professional schools and returned graduates. Through these channels educational institutions in this country can monitor the re-entry and subsequent professional employment experience of erstwhile students and in the process obtain essential feedback on the quality and relevance of U.S. professional study and practical training programs.

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*Recruiting Latin American Students in the U.S. for U.S. Firms Operating in Latin America: A Preliminary Investigation by Steiner and Arauco, August 1969. Graduate School of Business, the University of Texas at Austin, Austin, Texas 78712.

** See also Autumn 1970 issue of *El Informativo LASPAU*.

PART IV. CONCLUSION

It is clear that much can be done to improve the educational experience of the Latin Americans who come to the U.S. to study engineering. Many of the improvements suggested in this report can be implemented within the framework of existing institutional arrangements and in a manner consistent with current utilization of resources. This is particularly true of the recommendations with regard to selection and admission, post-arrival orientation and counseling, curriculum, and work experience.

Other measures—including those aimed at providing in-country (pre-admissions) guidance and pre-departure orientation for prospective students, as well as those designed to facilitate career placement or mitigate the re-entry problems of returned graduates—call for joint action by U.S. institutions, agencies and private business establishments in cooperation with their counterparts throughout Latin America. But before joint action can be undertaken at the international level, there must be a common awareness of problems, and a definition of common objectives on the part of colleges and universities in the U.S.

As a concrete step in this direction, the panel proposed the establishment of a permanent organization which would have responsibility for evaluating, on a continuing basis, the international education programs of U.S. engineering schools. The organization would investigate the flow of foreign engineering students through the U.S. educational system and would develop recommendations on the basis of its findings. Its conclusions would be made available to engineering colleges and foreign student advisers.

Over a period of time, it would also be possible for such an organization to develop a set of standards or guidelines which could be used as a basis for judging the performance of U.S. colleges of engineering. Concurrently, special educational problems could be identified, and appropriate solutions recommended.

Finally, a list of engineering colleges containing information concerning their capacity to provide appropriate educational programs for foreign engineering students could be compiled and distributed to individuals and agencies involved in advising foreign students as to where to pursue their studies in the U.S.